The Observations of Radio Emission From the Planets Mercury, Mars, and Saturn at Wavelength of 8 mm

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The first measurements of the brightness temperature of the planets Mercury, Mars, and Saturn at wavelength of 8 mm have been carried out with the help of the 22-m radio telescope RT-22 in 1964-1965.

The brightness temperature of Mercury subsolar point at mean solar distance T_0 has been derived from the measured data of the mean brightness disk temperature. Assuming the temperature distribution on the sunlit surface of planet being equal to $T = T_0 \cos^n \theta$, where θ is the angle of incidence of solar radiation, and the temperature of the dark hemisphere being zero, the subsolar point temperature will be 660 ± 120 °K, if $n = 1/4$, and 540 ± 85 °K, if $n = 0$. These results are in agreement with those of infrared measurements and point at the possibility of interpretation of the millimeter emission of Mercury as a thermal one caused by solar radiation.

The measured mean brightness disk temperature of Mars turned out to be 225 ± 10 °K. This result is in coincidence with the assumption that the layer giving out millimeter emission is warmed by solar radiation.

The measured mean brightness disk temperature of Saturn turned out to be 132 ± 9 °K, that is close to that measured in infrared range and confirm the presence of the enhanced radiation detected previously at wavelength of 10 cm.

Dr. M. S. Bobrov suggested that the radio emission from the rings of Saturn may decrease the mean brightness radio temperature to the level close to that measured recently by Dr. Low in the infrared range.

Discussion Following Salomonovich's Paper

K. I. Kellermann: With regard to Saturn, have you made an estimate of the radiation that would be contributed by the rings at longer wavelengths, and so perhaps provide a test of the idea that the rings are radiating significantly.

A. E. Salomonovich: No.

J. A. Roberts (to Kellermann): Why is it thought that the radio emission from the rings of Saturn is small?

K. I. Kellermann: Because the optical observations of the rings of Saturn suggest that they are extremely tenuous and have very low optical depth at radio frequencies.

C. Sagan: The possibility that there is radiation from the rings could be tested by searching for variations in the radiation from Saturn as the apparent inclination of the rings changes.

(Paper 69D12-596)